

Cooling load calculation for efficient cold storage of fresh-cut yam bean

ABSTRACT

Fresh-cut yam beans are highly perishable and required to be stored in a cold room that is maintained at 5°C and relative humidity of 90%. Nonetheless, the cold storage can be an unnecessarily high energy user if the refrigeration equipment is not selected appropriately to match the actual cooling load. This is not favorable for the fresh-cut processors that are mostly small and medium enterprises (SMEs). In this study, the design of cold storage for the fresh-cut yam bean was presented to comply the necessary requirement by food manufacturing standard. Based on the design, the correct calculation of the cooling load by considering all the possible heat sources was performed. The resulted cooling load was 53239.30 kW with 36% heat load sourced from fresh-cuts, 22% from transmission, 18% from infiltration, and the rest from workers, lighting, ventilation and defrosting. The designated cold storage for 240 kg fresh-cuts has the dimension of 4.9 x 2.5 x 3 m in length, width and height and accommodates adequate space for the workers and necessary equipment as well as features to minimize heat gains. The required refrigeration capacity was 3.33 kW and serve as basis for the selection of refrigeration equipment.

Keyword: Cold storage; Cooling load; Efficiency; Small and Medium enterprises